How is metapopulation resilience affected by longitudinal connectivity? a criterion for the restoration of river networks

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Climate change is rearranging the limits of geographic distributions of species. The populations inhabiting the latitudinal margins of a species' range are likely to be sensitive to climatic drivers. If these populations are extirpated, a latitudinal shift of the range is produced. When species are spatially structured into metapopulations, these will experiment a negative growth trajectory, and eventually become extirpated, when extinction rate (*e*) of local populations (*demes*) exceeds the rate of establishment of new colonies in available empty patches (*mp*).
Dispersal among patches is a process of central significance for the recolonization rate (*mp*). Therefore, the loss of longitudinal connectivity in river networks is likely to enhance the latitudinal displacement of a species' range in its rear edge, by reducing that rate. Moreover, if climate drifts towards more meridional conditions, the thermal habitat of some species can become constrained, and the extinction rates of local populations increased. This might be the case of salmonid species in southern Europe.
In this work the functioning of a salmonid metapopulation has been modeled by means of several coupled logistic population dynamics models with population viability thresholds. It has been parameterized for a very simple real metapopulation of introduced *Salvelinus fontinalis* in a glacier lakes system in the mountains of Central Spain. The resilience of the metapopulation has been expressed as a function of the connectivity among demes. Thus, the metapopulation resilience is proposed as a new criterion to assess the efficiency of the restoration of the longitudinal connectivity within a river network.